

WHAT IS CLAIMED IS:

1. A radio-frequency transmitter with a function of distortion compensation, comprising:

a branch part for branching an electrical signal into two;

5 a first optical transmission part for converting one of the electrical signals branched by said branch part into an optical signal;

a first coupler for branching into two the optical signal outputted from said first optical transmission part ;

10 a first optical-electrical conversion part for converting one of the optical signals branched by said first coupler into an electrical signal;

a distortion detection part for extracting a distortion component as a differential component between the electrical  
15 signal outputted from said first optical-electrical conversion part and the other of the electrical signals branched by said branch part ;

a second optical transmission part for inverting a phase of the distortion component extracted by said distortion  
20 detection part, and converting the distortion component into an optical signal;

an optical delay part for delaying the other of the optical signals branched by said first coupler by a predetermined

length of time; and

25           a second coupler for coupling the optical signal outputted from said second optical transmission part and the optical signal passed through said optical delay part, and sending out a resulting coupled optical signal to an optical transmission path as a transmission signal.

~~2.~~ A radio-frequency transmitter with a function of distortion compensation, comprising:

          a branch part for branching an electrical signal into two;

5           first and second light sources for outputting lights;

          a first external modulation part for modulating an optical signal in intensity outputted from said first light source based on one of the electrical signals branched by said branch part;

10          a first coupler for branching into two the optical signal outputted from said first external modulation part;

          a first optical-electrical conversion part for converting the other of the optical signals branched by said first coupler into an electrical signal;

15          a distortion detection part for extracting a distortion component as a differential component between the electrical signal outputted from said first optical-electrical conversion part and the other of the electrical signals branched by said

branch part;

20           a second external modulation part for inverting a phase of the distortion component extracted by said distortion detection part, and based on the distortion component, modulating the optical signal in intensity outputted from said second light source;

25           an optical delay part for delaying the other of the optical signals branched by said first coupler by a predetermined length of time; and

            a second coupler for coupling the optical signal outputted from said second external modulation part and the  
30   optical signal passed through said light delay part, and sending out a resulting coupled optical signal to an optical transmission path as a transmission signal.

3. The radio-frequency transmitter with the function of distortion compensation according to claim 1, further comprising:

            a second optical-electrical conversion part for  
5   converting a part of the optical signal outputted from said second coupler into an electrical signal; and

            an optical frequency control part for extracting a predetermined frequency component from the electrical signal outputted from said second optical-electrical conversion part,  
10   and controlling said first optical transmission part (and/or said

second optical transmission part to keep a difference in optical frequency constant between an optical carrier outputted from said first optical transmission part and another optical carrier outputted from said second optical transmission part.

4. The radio-frequency transmitter with the function of distortion compensation according to claim 2, further comprising:

5 a second optical-electrical conversion part for converting a part of the optical signal outputted from said second coupler into an electrical signal; and

an optical frequency control part for extracting a predetermined frequency component from the electrical signal outputted from said second optical-electrical conversion part,  
10 and controlling said first light source and/or said second light source to keep a difference in optical frequency constant between an optical carrier outputted from said first light source and another optical carrier outputted from said second light source .

~~5.~~ A radio-frequency transmitter with a function of distortion compensation, comprising:

a branch part for branching an electrical signal into two;

5 a multi-wavelength light source for outputting a light having optical spectra at a constant wavelength interval;

a wavelength separation part for extracting two of the optical spectra differing in wavelength by a predetermined value from the light outputted from said multi-wavelength light source,  
10 separating the extracted two spectra, and outputting as first and second optical signals;

a first external modulation part for modulating, based on the other of the electrical signals branched by said branch part, said first optical signal in intensity inputted by said  
15 wavelength separation part;

a first coupler for branching into two the optical signal outputted from said first external modulation part;

a first optical-electrical conversion part for converting the other of the optical signals branched by said first  
20 coupler into an electrical signal;

a distortion detection part for extracting a distortion component as a differential component between the electrical signal outputted from said first optical-electrical conversion part and the other of the electrical signals branched by said  
25 branch part;

a second external modulation part for inverting a phase of the distortion component extracted by said distortion detection part, and based on the distortion component, modulating said second optical signal in intensity inputted by said  
30 wavelength separation part;

an optical delay part for delaying the other of the

optical signals branched by said first coupler by a predetermined length of time; and

35 a second coupler for coupling the optical signal outputted from said second external modulation part and the optical signal passed through said light delay part, and sending out a resulting coupled optical signal to an optical transmission path as a transmission signal.

~~6.~~ A radio-frequency transmitter with a function of distortion compensation, comprising:

a branch part for branching an electrical signal into two;

5 a delay part for delaying one of the electrical signals branched by said branch part by a predetermined length of time;

a first optical transmission part for converting the electrical signal outputted from said delay part into an optical signal;

10 a distortion generating part for generating, from the other of the electrical signals branched by said branch part, a distortion component of predetermined amplitude having a phase opposite to a distortion component occurred in said first optical transmission part;

15 a second optical transmission part for converting the distortion component outputted from said distortion generating part into an optical signal; and

a second coupler for coupling the optical signal outputted from said first optical transmission part and the optical signal from said second optical transmission part, and sending out a resulting coupled optical signal to a transmission path as a transmission signal.

7. A radio-frequency transmitter with a function of distortion compensation, comprising:

a branch part for branching an electrical signal into two;

a delay part for delaying one of the electrical signals branched by said branch part by a predetermined length of time;

first and second light sources for outputting lights;

a first external modulation part for modulating the optical signal in intensity outputted from said first light source based on the electrical signal outputted from said delay part;

a distortion generating part for generating, from the other of the electrical signals branched by said branch part, a distortion component of predetermined amplitude having a phase opposite to a distortion component occurred in said first external modulation part;

a second external modulation part for modulating the optical signal in intensity outputted from said second light source based on the distortion component outputted from said distortion generating part; and

20           a second coupler for coupling the optical signal  
outputted from said first external modulation part and the optical  
signal from said second external modulation part, and sending out  
a resulting coupled optical signal to a transmission path as a  
transmission signal.

8. The radio-frequency transmitter with the function  
of distortion compensation according to claim 6, further  
comprising:

5           a second optical-electrical conversion part for  
converting a part of the optical signal outputted from said second  
coupler into an electrical signal; and

10           an optical frequency control part for extracting a  
predetermined frequency component from the electrical signal  
outputted from said second optical-electrical conversion part,  
and controlling said first optical transmission part and/or said  
second optical transmission part to keep a difference in optical  
frequency constant between an optical carrier outputted from said  
first optical transmission part and another optical carrier  
outputted from said second optical transmission part.

9. The radio-frequency transmitter with the function  
of distortion compensation according to claim 7, further  
comprising:

          a second optical-electrical conversion part for



5 converting a part of the optical signal outputted from said second coupler into an electrical signal; and

an optical frequency control part for extracting a predetermined frequency component from the electrical signal outputted from said second optical-electrical conversion part,  
10 and controlling said first light source and/or said second light source to keep a difference in optical frequency constant between an optical carrier outputted from said first light source and another optical carrier outputted from said second light source .

~~10.~~ A radio-frequency transmitter with a function of distortion compensation, comprising:

a branch part for branching an electrical signal into two;

5 a delay part for delaying one of the electrical signals branched by said branch part by a predetermined length of time;

a multi-wavelength light source for outputting a light having optical spectra at a constant wavelength interval;

a wavelength separation part for extracting two of the  
10 optical spectra differing in wavelength by a predetermined value from the light outputted from said multi-wavelength light source, separating the extracted two spectra, and outputting as first and second optical signals;

a first external modulation part for modulating, based  
15 on the electrical signal outputted from said delay part, said

first optical signal in intensity inputted by said wavelength separation part;

20 a distortion detection part for generating, from the other electrical signals branched by said branch part, a distortion component of predetermined amplitude having a phase opposite to a distortion component occurred in said first external modulation part;

25 a second external modulation part for modulating, based on the distortion component outputted from said distortion detection part, said second optical signal in intensity inputted by said wavelength separation part; and

30 a second coupler for coupling the optical signal outputted from said first external modulation part and the optical signal outputted from said second external modulation part, and sending out a resulting coupled optical signal to an optical transmission path as a transmission signal.

~~11.~~ A radio-frequency transmitter with a function of distortion compensation, comprising:

a branch part for branching an electrical signal into two;

5 a delay part for delaying one of the electrical signals branched by said branch part by a predetermined length of time;

a distortion generating part for generating, from the other of the electrical signals branched by said branch part, a

distortion component of a predetermined phase and amplitude;

10           a combiner for combining the electrical signal  
outputted from said delay part and the distortion component  
outputted from said distortion generating part;

          a frequency conversion part for converting a resulting  
signal outputted from said combiner into a predetermined  
15 frequency; and

          a radio-frequency optical transmission part for  
converting a resulting signal converted into the predetermined  
frequency by said frequency conversion part into an optical  
signal; wherein

20           the distortion component generated in said distortion  
generating part is opposite in phase to a distortion component  
occurred in said radio-frequency optical transmission part.

~~12.~~ A radio-frequency transmitter with a function of  
distortion compensation, comprising:

          a branch part for branching an electrical signal into  
two;

5           a delay part for delaying one of the electrical signals  
branched by said branch part by a predetermined length of time;

          a distortion generating part for generating, from the  
other of the electrical signals branched by said branch part, a  
distortion component of a predetermined phase and amplitude;

10           a combiner for combining the electrical signal

outputted from said delay part and the distortion component  
outputted from said distortion generating part;

a frequency conversion part for converting a resulting  
signal outputted from said combiner into a predetermined  
5 frequency; and

a radio-frequency amplification part for amplifying a  
resulting signal converted into the predetermined frequency by  
said frequency conversion part into an optical signal; wherein

the distortion component generated in said distortion  
10 generating part is opposite in phase to a distortion component  
occurred in said radio-frequency amplification part.